NEEDS AND OPPORTUNITIES FOR LONGLEAF PINE ECOSYSTEM RESTORATION IN FLORIDA

Kenneth W. Outcalt, USDA Forest Service, Athens, GA

ABSTRACT: Data from permanent plots measured periodically by Forest Inventory and Analyses of the Southern Research Station, USDA Forest Service shows a continuing decline in the longleaf pine (*Pinus palustris* Mill.) ecosystem in Florida from 1987 to 1995. Conversion to some other forest type resulted in a net loss of 58,000 ha of natural stands of longleaf pine. An additional 37,000 ha of natural longleaf was lost to other land uses with 90 percent of the conversions on private lands. Since these trends are likely to continue, restoration will become increasingly important. There are significant quantities of sites available for restoration, especially former longleaf pine sites now dominated by scrub oak. In 1995 there were 147,000 ha of this scrub oak - longleaf type in Florida. The dominance of oaks is being reversed on public lands. During the last 8 years Eglin Air Force Base restored 7,700 ha and State agencies restored 1,200 ha. Private owners control 80,000 ha of scrub oak - longleaf type available for restoration.

INTRODUCTION

Longleaf pine was the key tree species in a complex of fire dependent communities, that once stretched across the Southeastern United States (Stout and Marion 1993). Conversions of land to agricultural and urban uses and replacement of longleaf with other pine species following logging have drastically reduced the area occupied by longleaf pine. The decline of the longleaf forest has been periodically noted over the last century (Mohr 1886, Schwarz 1907, Wahlenberg 1946, Sirmon and Dennington 1989, Kelly and Bechtold 1990, Outcalt and Sheffield 1996). Today about 1.2 million ha of longleaf dominated forest remain (Outcalt and Sheffield 1996) with less than 4,000 ha of old growth (Means 1996). Florida has the most remaining longleaf type with 300,000 ha. The purpose of this study was to assess recent changes in longleaf area in Florida and to evaluate opportunities for longleaf restoration.

METHODS

This paper is based on information gathered by the Forest Inventory and Analysis (FIA) units of the Southern Research Station, USDA Forest Service, Asheville, NC. Personnel conducted inventories on permanent sample plots systematically distributed across the land to obtain a proportionate sample of all major forest types, sites, and ownership classes in the state. Each sample plot represented a specific number of equivalent hectares of timberland from the entire population. This number, termed the expansion factor, had an average value of 1077 ha for sample plots located in longleaf pine forest type in Florida. Totals in this report were obtained by summing the expansion factors for all plots where longleaf pine comprised more than 50% of the tree cover.

At each sample location, personnel used a multi-point cluster plot to collect data on a representative sample of trees. Trees 12.7 cm in diameter and larger were selected using a basal-area factor of 8.6 m^2 per ha. Trees smaller than 12.7 cm were tallied on small, fixed plots that shared common point centers with each variable radius point center. Plot-level classifications used in the study were either computed or assigned in the field. Stocking-related items, such as forest type and stand size, were assigned in the field and verified during data editing and compiling for consistency with actual tree data collected. Variables such as site type and stand origin were assigned based on observations during the data collection phase. Data for the 1987 and 1995 survey cycles was used to track trends in longleaf type in Florida.

RESULTS

Between 1987 and 1995, conversion of land occupied by longleaf pine to other uses resulted in the loss of 37,000 ha of longleaf pine type. Over this 8 year period about 3,000 ha per year were converted from longleaf pine to urban uses and 1,500 ha per year were converted to agriculture. About 90 percent of this land use conversion occurred on private lands while small amounts, mostly for roads, occurred on other ownerships (Figure 1). The greatest gains from conversion back to longleaf pine also occurred on private lands. This resulted primarily from planting longleaf on abandoned agricultural land that was spurred by incentives under the USDA Conservation Reserve Program. Overall losses to urban growth and agriculture were over 4 times greater than gains from conversions back to longleaf pine.

Conversion of longleaf to other forest types continued during the last survey cycle. Most of the conversion to slash pine (*P. elliottii* Engelm.) occurred on forest industry and private lands (Figure 2). Longleaf was harvested

and slash pine planted on about 17,000 ha and slash pine captured another 9,000 ha from longleaf via natural in-growth. Forest industry also harvested longleaf pine from some sites and replaced it with loblolly pine (*P. taeda* L.) (Figure 3). The largest forest type change, 21,000 ha, was from longleaf pine to scrub oaks, mainly turkey (*Quercus laevis* Walt.) and bluejack (*Q. incana* Bartr.), with longleaf as a minor component (Figure 4). Most of this conversion was from scrub oaks outgrowing the longleaf pine and capturing sites. A lesser amount occurred where longleaf pine was planted following harvest, but scrub oaks captured the site. Other upland hardwoods also captured significant areas of longleaf pine mainly following harvest of the longleaf (Figure 5). Natural in-growth of hardwoods resulted in capture of longleaf sites on public, forest industry and private lands.

There were also some conversions in the opposite direction where longleaf pine replaced other species. Slash pine was harvested on a number of areas and replaced with planted longleaf seedlings (Figure 6). In other mixed slash and longleaf pine stands longleaf took over dominance by natural in-growth. Most of these gains occurred on private lands. New longleaf stands were also established on areas formally occupied by scrub oaks (Figure 7). Both forest industry and the National Forest converted areas by reducing oaks and planting longleaf seedlings. The greatest gains however, occurred from longleaf pine capturing sites from scrub oaks by natural in-growth.

Combining losses and gains from both land use and type changes shows overall there was still a net loss of longleaf area on all ownerships over the last 8 years (Figure 8). Losses were greater on xeric sandhills sites than on the more mesic upland and flatwoods sites. Much of this is the result of scrub oaks capturing dry sites from longleaf pine. In 1995 there were 147,000 ha of this scrub oak type in Florida. This is a large area available for restoration to longleaf pine. The State owns 20,000 ha of this type and other federal lands contain 30,000 ha. During the last 8 years 7,700 ha were restored to longleaf on other federal lands and 1,200 ha on state lands. Although the net effect is still an overall loss, even on private lands significant areas of scrub oaks are being converted to longleaf pine (Figure 9).

DISCUSSION

Urban growth will continue to consume former longleaf pine forest areas as the population of Florida grows. This will occur mainly on private lands. The gains in longleaf pine type from planting abandoned agricultural lands will offset only a small portion of this loss. Conversion of natural longleaf stands to slash and loblolly plantations on private lands was quite low over the last 8 years. In addition nearly as much new longleaf was established by planting seedlings following harvest of slash pine. Similarly dominance of sites with mixed stands by slash pine was offset by capture of other sites by longleaf pine. Thus, net change in longleaf area due to conversion to other pine species was rather minor. The greatest longleaf losses resulted from conversion to scrub oaks. However, very little of this conversion even on private lands was due to harvest of the longleaf followed by abandonment to scrub species. A substantial area on private lands was planted to longleaf pine and with subsequent growth it will likely capture the sites from competing oaks. Competition is much more severe on mesic uplands. Many of these sites are being captured by upland hardwoods following harvest of longleaf pine. This may be cause for concern, as this habitat type is rather limited in many areas because most of it was cleared for agricultural use during initial settlement.

Opportunities to replace losses of longleaf habitat by restoring longleaf to former sites are greatest in scrub oak type. Public agencies and forest industry are already actively converting scrub oak sites back to longleaf pine and have nearly reached the break even point. Gains will likely soon surpass losses as the effects of increased prescribed burning and other scrub oak control measures tip the balance in favor of longleaf pine. Private lands contain 80,000 ha of scrub oak type available for conversion to longleaf pine. Although losses still are greater than gains longleaf is capturing about 1,400 ha per year. Also there is a lag factor caused by the advanced size of the scrub oaks that exist on sites when the mature overstory of longleaf pine is removed. Many second growth stands of longleaf on private lands that have been harvested in the last 15 years were captured by these pre-existing scrub oaks. However, many also contain longleaf seedlings and saplings that are expected to eventually regain dominance of the area. This process could be augmented and considerably hastened by scrub oak reduction and control operations.

LITERATURE CITED

Kelly, J.F., and W.A. Bechtold. 1990. The longleaf pine resource. In: Farrar, R.M., Jr. Editor, Proc. Symp. on management of longleaf pine. April 4-6, 1989, Long Beach, MS. USDA For. Serv. Gen. Tech. Rep. SO-75, Southern For. Exp. Stn., New Orleans, LA pp11-22.

Means, D.B. 1996. Longleaf pine forest, going, going,... In Eastern Old-Growth Forests: Prospects for rediscovery and recovery. M.B. Davis, Ed. pp 210-229.

Mohr, C.T. 1896. The timber pines of the southern United States. USDA Div. of Forestry Bull. No. 13, Washington, DC 140p.

Outcalt, K.W., and R.M. Sheffield. 1996. The longleaf pine forest: trends and current conditions. USDA For. Serv. Resource Bull. SRS-9, Southern Res. Stn. Asheville, NC 23p.

Schwarz, G.F. 1907. The longleaf pine in virgin forest: A silvical study. John Wiley & Sons, New York. 135p.

Sirmon, G.A., and R.W. Dennington. 1989. Longleaf pine management on the Desoto National Forest -- A case study. Southern J. Applied Forestry 13:34-40.

Stout, I. J., and W. R. Marion. 1993. Pine flatwoods and xeric pine forests of the southern (lower) coastal plain. In Biodiversity of the southeastern United States: lowland terrestrial communities. Martin, W. H., S.G. Boyce, and A. C. Echternacht. Eds. pp 373-446.

Wahlenberg, W.G. 1946. Longleaf pine: Its use, ecology, regeneration, protection, growth, and management. C.L. Pack Forestry Foundation and USDA For. Serv. Washington, DC 429p.

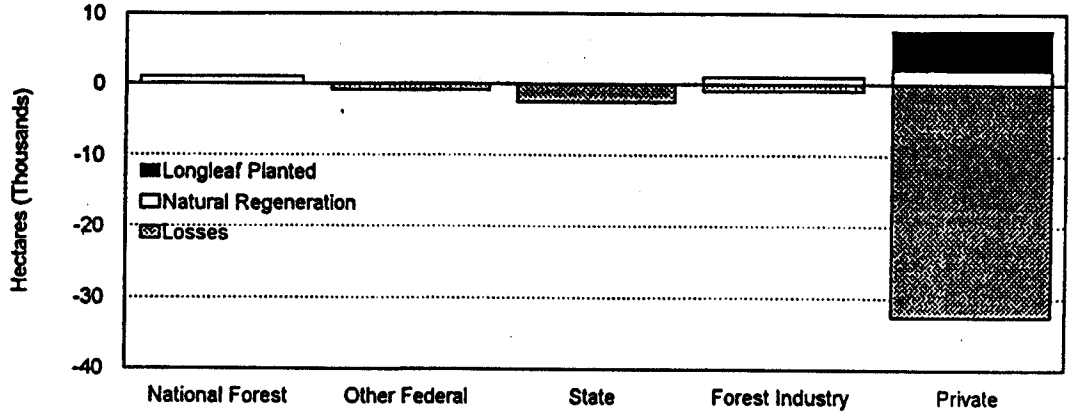

Figure 1. Effect of land use changes on longleaf type in Florida (1987 vs. 1995).

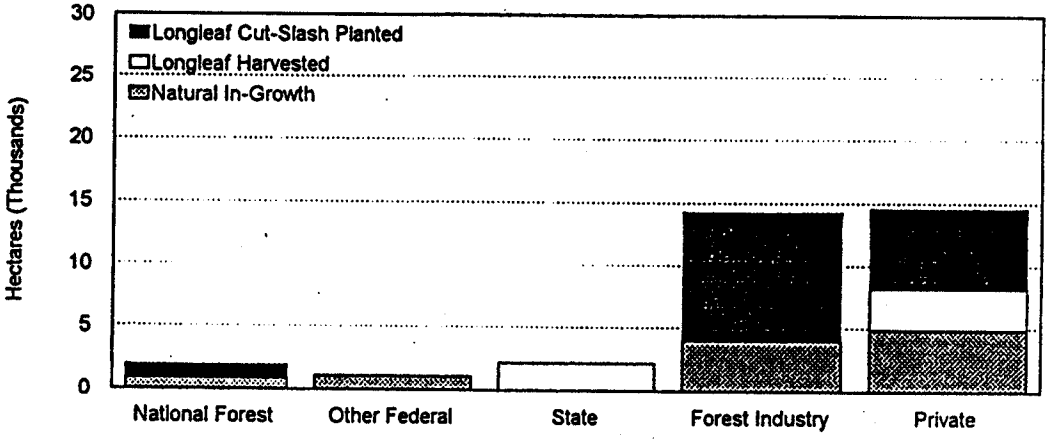

Figure 2. Loss of longleaf type in Florida to slash pine (1987 vs. 1995).

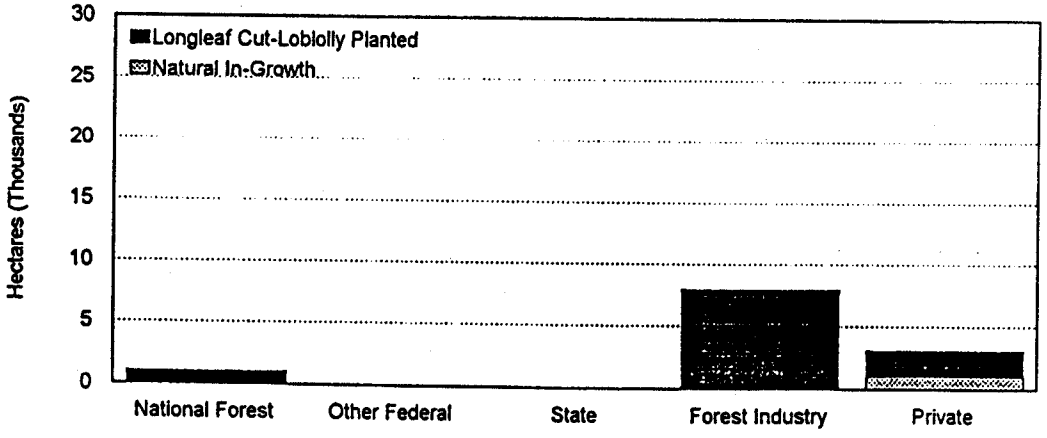

Figure 3. Loss of longleaf type in Florida to loblolly pine (1987 vs. 1995).

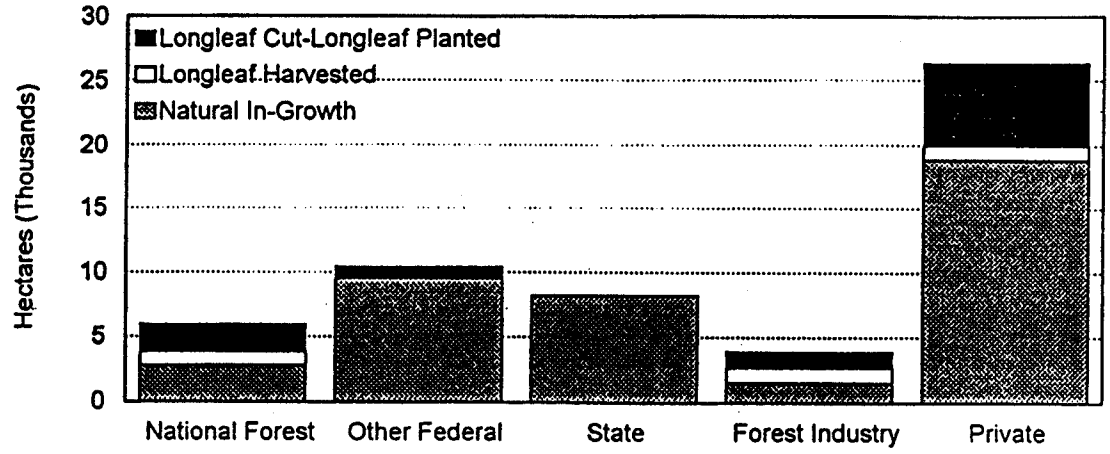

Figure 4. Loss of longleaf type in Florida to scrub oaks (1987 vs. 1995).

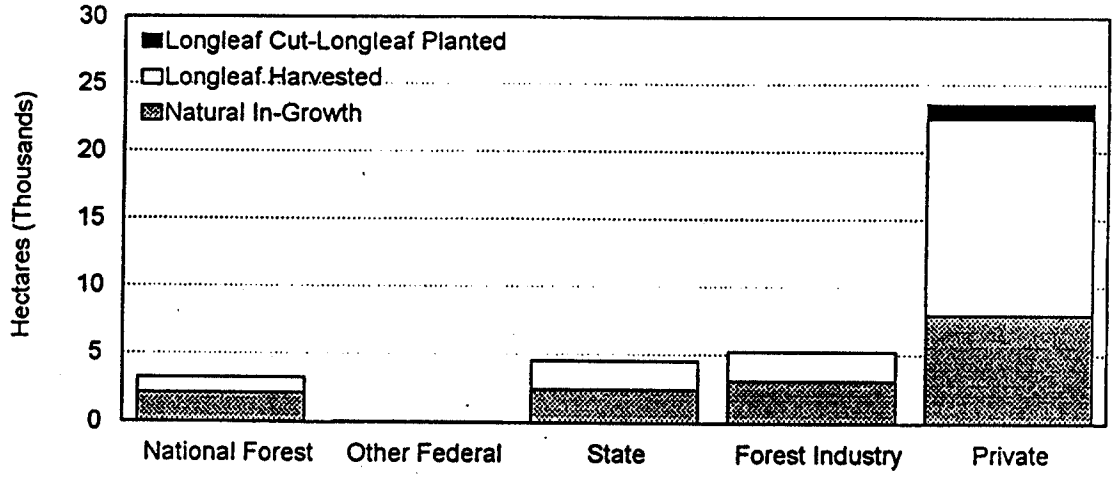

Figure 5. Loss of longleaf type in Florida to other hardwoods (1987 vs. 1995).

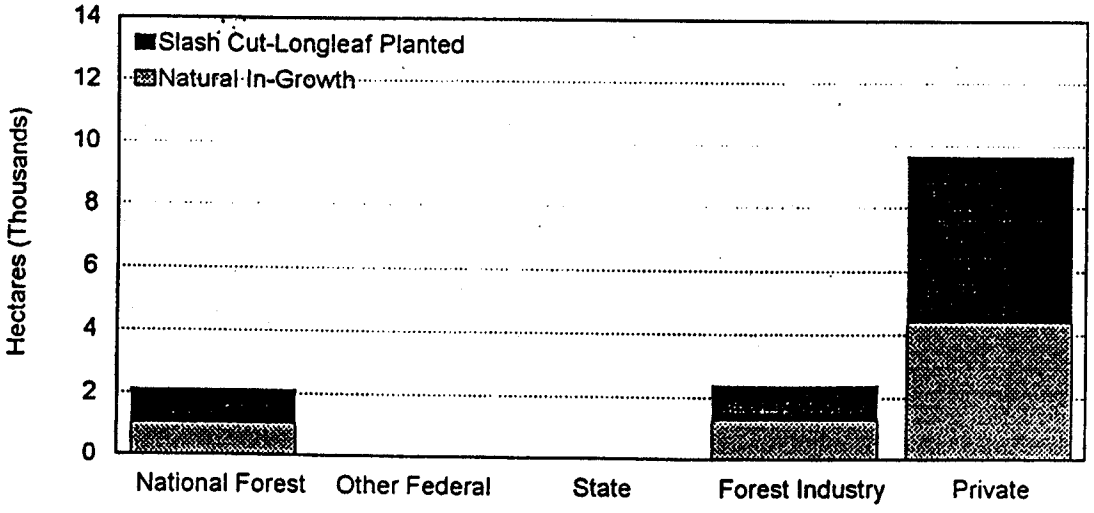

Figure 6. New longleaf in Florida from conversion of slash pine (1987 vs. 1995).

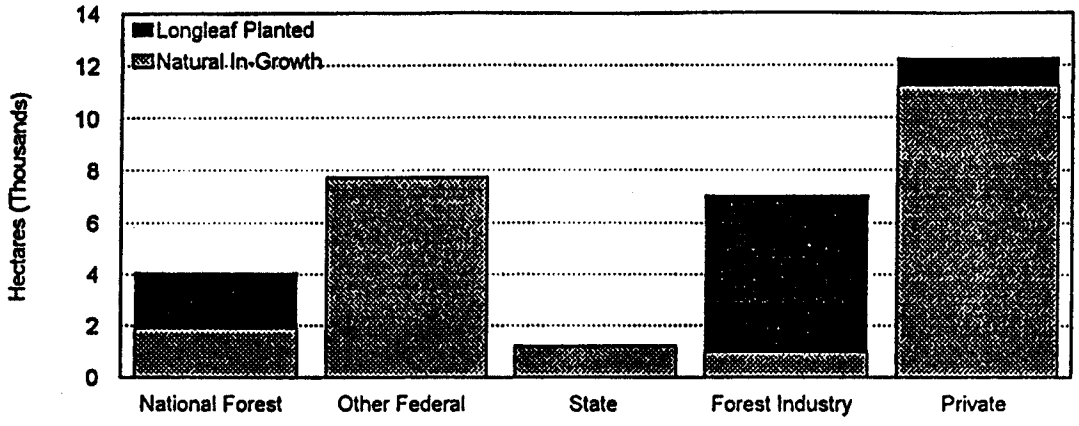

Figure 7. New Longleaf in Florida from Conversion of Scrub Oaks (1987 vs. 1995)

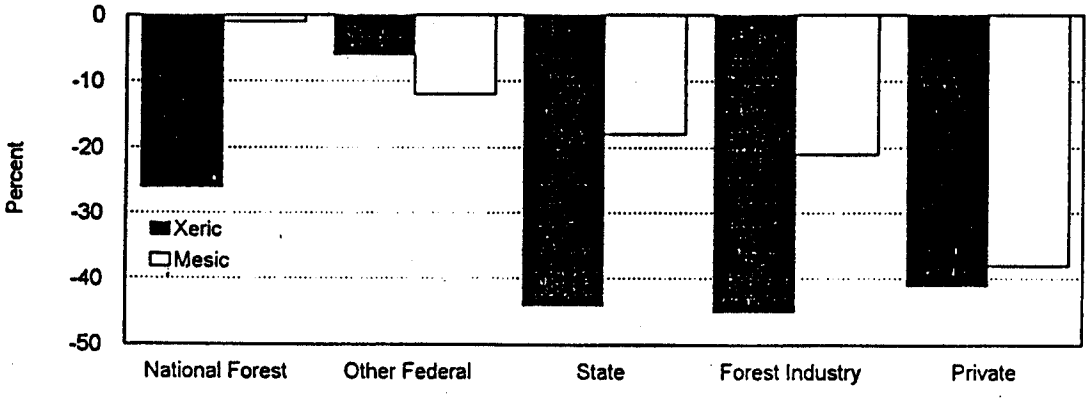

Figure 8. Net change in Natural Longleaf in Florida by Site Type (1987 vs. 1995)

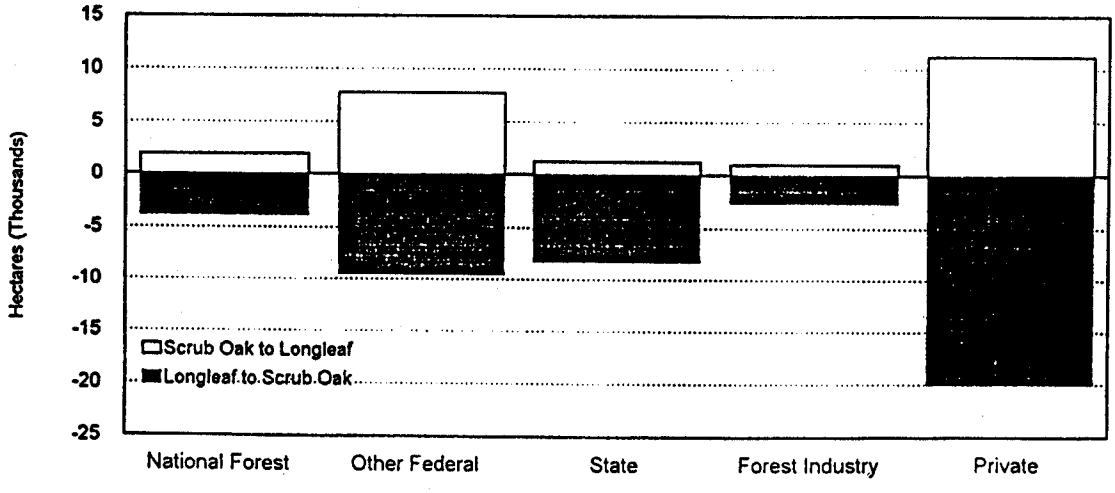

Figure 9. Conversions Between Natural Longleaf and Scrub Oak Types in Florida (1987 vs. 1995)